Published in final edited form as:

Epidemiol Infect. 2014 January ; 142(1): 114–125. doi:10.1017/S0950268813000654.

Impact of medical and behavioural factors on influenza-like Illness, healthcare-seeking, and antiviral treatment during the 2009 H1N1 pandemic — United States, 2009–2010

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Summary

We analysed a cross-sectional telephone survey of U.S. adults to assess the impact of selected characteristics on healthcare-seeking behaviours and treatment practices of people with influenza-like illness (ILI) from September 2009–March 2010. Among 216,431 respondents, 8.1% reported ILI. After adjusting for selected characteristics, respondents 18–64 years old with the following factors were more likely to report ILI: a diagnosis of asthma (1.88 adjusted odds ratio [aOR]; 95% CI, 1.67–2.13) or heart disease (1.41 aOR; 95% CI 1.17–1.70), being disabled (1.75 aOR; 95% CI, 1.57–1.96), and reporting financial barriers to healthcare access (1.63 aOR; 95% CI, 1.45–1.82). Similar associations were seen among respondents ≥65 years old. Forty percent of respondents with ILI sought healthcare, and 14% who sought healthcare reported receiving influenza antiviral treatment. Treatment was not more frequent in patients with high-risk conditions, except those 18–64 years old with heart disease (1.90 aOR; 95% CI, 1.03–3.51). Among patients at high-risk for influenza complications, self-reported ILI was greater but receipt of antiviral treatment was not, despite guidelines recommending their use in this population.

Keywords

Influenza; influenza antiviral treatment; influenza A (H1N1)pdm09; healthcare-seeking behaviour

Introduction

During the 2009 pandemic, the Centers for Disease Control and Prevention (CDC) recommended early empiric influenza antiviral treatment for groups at risk for severe

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Disclaimer: The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

The authors declare no conflicts of interest with the publication of this manuscript. Matthew Biggerstaff had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

outcomes from influenza A (H1N1)pdm09 virus infection, including persons ≥65 years old and persons with underlying medical conditions such as asthma, diabetes, or heart disease[1]. Although evidence suggests that clinicians followed Advisory Committee on Immunization Practices recommendations for use of antiviral agents among hospitalized patients[2], little is known about the propensity of high-risk persons in the community to seek healthcare for influenza or how frequently they received antiviral treatment.

We utilized the Behavioral Risk Factor Surveillance System (BRFSS) to describe the characteristics of U.S. adults reporting symptoms consistent with influenza, healthcare seeking behaviours, and influenza diagnosis and antiviral treatment during the 2009 pandemic.

Methods

The BRFSS is a state-based, random-digit-dialed telephone survey among the non-institutionalized U.S. population ≥18 years. It is the main source for state-based data on the prevalence of health-risk behaviours, chronic health conditions, and preventive health services related to chronic disease and injury; survey methodology is described elsewhere[3].

From September 1, 2009, to March 31, 2010, BRFSS respondents in 49 states (excluding Vermont), the District of Columbia (D.C.), and Puerto Rico were interviewed using a module designed to evaluate the presence of symptoms of influenza-like illness (ILI)[4]. Respondents having fever with either cough or sore throat in the 30 days preceding interview date were defined as having had ILI[a]. To determine if respondents with ILI sought medical care, they were asked if they had visited a healthcare professional for their illness[b]. Respondents with ILI who sought medical care were asked about their clinical diagnosis[c] and whether they were tested for influenza[d] or received antiviral drugs intended for treating influenza[e].

Self-reported characteristics included demographics, underlying medical conditions, behavioural characteristics, and healthcare access factors. Demographic characteristics evaluated were age; sex; race/ethnicity; educational attainment; and employment status. Underlying medical conditions evaluated were asthma; diabetes (excluding a diagnosis only during pregnancy); heart disease (ever having been diagnosed with myocardial infarction;

[a]To determine the presence of ILI among respondents, two questions were asked: “During the past month, were you ill with a fever?” If the respondent answered yes to fever in the past month they were asked “Did you also have a cough and/or sore throat?” A “Yes” answer to both was classified as ILI.

[b]To determine if medical care was sought among those with ILI, respondents were asked: “Did you visit a doctor, nurse, or other health professional for this illness?”

[c]To determine the clinical diagnosis, respondents were asked “What did the doctor, nurse, or other health professional tell you? Did they say …” and given the choice of three responses: 1. “You had regular influenza or the flu.” 2. “You had swine flu, also known as H1N1 or novel H1N1.” or 3. “You had some other illness, but not the flu.” A clinical diagnosis of influenza was defined as either the first or second response, and laboratory confirmation of influenza was not required.

[d]To determine if an influenza test was administered, respondents were asked, “Did you have a flu test that was positive for this illness? Usually a swab from your nose or throat is tested. Would you say …” and given the choice of three responses: 1. “Yes, had flu test and it was positive”, 2. “No, had flu test but it was negative.”, or 3. “No, flu test was not done.” Having an influenza test administered was defined as either the first or second response.

[e]To determine if antiviral treatment was given for the illness, respondents were asked “Did you receive Tamiflu® or oseltamivir [or an inhaled medicine called Relenza® or zanamivir to treat this illness?”

angina; or coronary heart disease); the World Health Organization's body mass index (BMI) classification (underweight, normal weight, overweight, obese) as calculated from self-reported weight and height. Disability (limited because of physical, mental, or emotional problems or any health problem that requires the use of special equipment) was also recorded. Behavioural factors evaluated were smoking (current smoker [having smoked at least 100 cigarettes and currently smoke every day or some days], former smoker [having smoked at least 100 cigarettes but currently does not smoke], and never smoked [have not smoked at least 100 cigarettes]); binge drinking (males having ≥5 drinks on one occasion; females having ≥4 drinks on one occasion); and average daily alcohol consumption (non-drinker [no alcohol], moderate drinker [≤2 drinks for men; ≤1 drink for women]; and heavy drinker [>2 drinks for men; >1 drink for women]). Indicators of healthcare access evaluated were insurance status at the time of interview among those 18–64 years old; report of having a personal doctor(s); and report of financial barriers to care (episodes in the past year when respondent needed to see a doctor but could not because of cost). Persons who reported current asthma, diabetes, or heart disease were defined as having had a high-risk medical condition.

We used SAS-callable SUDAAN® v.10 statistical software (Research Triangle Institute, NC) to calculate population-weighted estimates and corresponding standard errors, 95% confidence intervals [CI], odds ratios [OR], and *p*-values, taking into account the complex design of the BRFSS sampling plan. We used linear contrasts and chi squares to evaluate differences in self-reported ILI, healthcare-seeking behaviour, influenza diagnosis and antiviral drug receipt by selected characteristics. *P* values <0.05 were considered statistically significant. To allow for comparison among the factors evaluated, prevalence estimates were sex- and age-adjusted using the standard year 2000 projected U.S. population when appropriate[5]. Response rates for BRFSS were calculated using Council of American Survey and Research Organizations (CASRO) guidelines.

We examined independent associations between respondent characteristics and the report of ILI and receipt of antiviral treatment using logistic regression models. These models were stratified by age group [respondents 18–64 years old and respondents ≥65 years old] because the prevalence of underlying medical conditions, behavioural risk factors, and healthcare access differ by age[6]. We used the following candidate variables: age group; sex; race/ethnicity; education attainment; employment status; the presence of asthma, diabetes, heart disease, and disability; BMI classification; smoking, binge drinking, and daily alcohol consumption status; insurance status (excluding persons ≥65 years old because Medicare serves as their primary source of reimbursement for medical care)); report of a personal doctor and financial barriers to care; and report of a clinical influenza diagnosis or an influenza test (for the influenza treatment model only). To develop multivariable models, we included all candidate variables in a logistic model and removed non-significant variables using step-wise elimination, starting with the variable with the smallest magnitude of effect, until all remaining variables had Wald F *p*-values <0.05 or removing an additional variable significantly increased the -2 log likelihood of the model. We evaluated confounding by adding each excluded variable back into the final model individually and examining changes

in the β-coefficients of the included variables; if addition of one of the excluded variables caused a change in a β-coefficient of ≥10%, the variable was retained in the model.

Results

Report of ILI

From September 2009 through March 2010, self-reported ILI data were available from 216,431 respondents. Median survey response rate was 55% (state range: 24%–74%), calculated as the percentage of persons who completed interviews among all eligible persons, including those who were not contacted. Median cooperation rate was 75% (state range: 55%–95%), calculated as the percentage of persons who completed interviews among all eligible persons who were contacted.

Among respondents, 8.1% reported ILI in the month before interview[4]. Compared with respondents not reporting ILI, those with ILI were younger and significantly more likely to be women, as well as less educated, unable to work, or disabled (Table 1). Respondents with ILI were also significantly more likely to have a high-risk condition, be current smokers or binge drinkers, lack health insurance, and report financial barriers to care compared to those who did not report ILI. Regardless of the age group examined, respondents with a high-risk condition reported ILI more often than respondents without a high-risk condition ($p<0.01$ for all three age groups examined; Figure 1).

Multivariable logistic regression models controlling for potential confounders identified several factors independently associated with greater ILI among respondents 18–64 years old and ≥65 years old, including a current or former diagnosis of asthma or heart disease, having a disability, being a current smoker, or reporting financial barriers to healthcare (Tables 2 and 3). Respondents 18–64 years old who were obese also had increased odds of reporting ILI (Table 2). After adjusting for other factors, the association between ILI and diabetes was increased but not significant in either age stratum.

Report of healthcare seeking

Among 14,601 respondents with ILI, 40% sought healthcare for their illness. Compared with respondents who did not seek healthcare, those who did were more likely to be older, female, and unable to work (Table 1). Several high-risk medical conditions and reported disability were also more common in respondents who sought healthcare. In every age group, respondents with high-risk conditions sought healthcare more often than respondents without high-risk conditions ($p<0.01$ for respondents aged 18–49 and 50–64 and $p=0.02$ for respondents aged ≥65 years old; Figure 1). Among respondents who sought healthcare, 32% reported having been tested for influenza and 42% of those tested recalled a positive influenza test result.

Compared with respondents who sought healthcare, those who did not were more likely to be current smokers; be binge, moderate, or heavy drinkers; not have health insurance or a personal doctor; or report financial barriers to healthcare (Table 1).

Report of a clinical influenza diagnosis

Among 6,148 respondents with ILI who sought healthcare, 26% received a clinical diagnosis of influenza. None of the underlying medical conditions, behavioural, or healthcare access factors we analysed varied significantly between those who were and were not diagnosed with influenza (data not shown). However, when compared to respondents not receiving an influenza diagnosis, respondents receiving an influenza diagnosis were more likely to be younger (persons aged 18–64 years: 93.7% of respondents with an influenza diagnosis versus 89.5% of respondents without an influenza diagnosis; $p<0.01$) and Hispanic (Hispanic: 18.2% of respondents with an influenza diagnosis, 11.8% of respondents without an influenza diagnosis, $p=0.02$).

Report of influenza antiviral treatment

Receipt of influenza antiviral treatment was ascertained among 5,265 respondents with ILI who sought healthcare. Overall, 14% of respondents and 36% of respondents who received a clinical diagnosis of influenza received influenza antiviral treatment; those receiving antiviral treatment were more likely to have been tested for influenza and receive a positive influenza test result (Table 4). Respondents receiving antiviral treatment were also more likely to be younger and employed than respondents who did not receive antiviral treatment. No other underlying conditions, behavioural factors, or healthcare access factors were significantly associated with receipt of antiviral treatment. Notably, having a high-risk condition was not significantly associated with receiving influenza antiviral treatment, regardless of age group ($p>0.05$ for all three age groups examined; Figure 1).

Multivariable logistic regression models controlling for potential confounders found an almost 13-fold increased odds of influenza antiviral treatment with an influenza diagnosis among respondents 18–64 years old [OR, 12.7; 95% CI, 8.1 to 20.0] while the effect of an influenza diagnosis was less than half this value among respondents ≥65 years old [OR, 5.50; 95% CI, 2.5 to 12.0] (see Table S1&S2). Additionally, receiving an influenza test was associated with greater odds of influenza antiviral treatment for both respondents 18–64 years old [OR, 2.7; 95% CI, 1.8 to 4.1] and ≥65 years old [OR, 2.4; 95% CI, 1.1 to 5.4]. Respondents 25–34 years (OR, 2.1; 95% CI, 1.0 to 4.2) or who reported heart disease (OR, 1.90; 95% CI, 1.0 to 3.5) had increased odds of receiving influenza antiviral treatment, and persons reporting unemployment had decreased odds of receiving influenza antiviral treatment [OR, 0.4; 95% CI, 0.2 to 0.88]. Respondents ≥65 years old who reported other employment (unemployed, homemaker, student, or retired) [OR, 0.30; 95% CI, 0.11 to 0.85] or having no personal doctor [OR, 0.02; 95% CI, 0.00 to 0.48] had decreased odds of receiving influenza antiviral treatment.

Comment

This large study of community-dwelling persons during the 2009 pandemic found that prevalence of ILI and healthcare seeking for ILI varied by underlying medical condition, behavioural factors, and healthcare access factors of respondents. In contrast, treatment of influenza with antiviral agents was similar among patients with and without many of the high-risk conditions evaluated and was decreased in unemployed and patients ≥65 years old.

Younger adults, current smokers, and those reporting asthma, heart disease, or disability were more likely to report ILI, suggesting an increased susceptibility to ILI among these groups. Increased illness from H1N1pdm09 virus infection among younger persons is well documented[7, 8], but to our knowledge, no study has systematically assessed influenza susceptibility or the likelihood to develop ILI among those with high-risk conditions, and behavioural risk factors (e.g., smoking or heavy alcohol consumption)[9]. Limited evidence can be found in vaccine trials, community studies, or outbreak investigations, which suggest that smoking[10–15], asthma[16–20], obesity[19], and heart disease[21] are associated with either increased ILI, increased influenza, or an increased likelihood to develop ILI, although findings are not specific to H1N1pdm09 or the age groups evaluated in this study. Moreover, other studies fail to confirm these relationships[22–24].

Our results also suggest that adherence by healthcare providers to antiviral treatment recommendations during the pandemic was poor in the outpatient setting. Receipt of antiviral treatment was uncommon among adults with ILI who sought care for their illness and was not significantly affected by the presence of most high-risk conditions. In this survey, asthma, diabetes, heart disease, and age ≥65 years old was associated with greater healthcare seeking for ILI. However, no high-risk condition, except heart disease among respondents 18–64 years old, was significantly associated with greater receipt of influenza antiviral treatment compared to persons without these high-risk conditions. Additionally, although not significant, the effect of a clinical diagnosis of influenza on receipt of antiviral treatment among respondents ≥65 years old was half of that in respondents 18–64 years old, and overall proportions of influenza antiviral treatment in this age group were low. Among adults, these underlying medical conditions, as well as age ≥65 years, are known to increase the risk for complications from influenza[9]. During the 2009 pandemic, early antiviral treatment was recommended for persons with high-risk conditions, regardless of influenza severity[1]. Prompt treatment with antiviral medications has been shown to reduce the risk of complications from seasonal influenza[25, 26], and treatment for persons with high-risk conditions should not be delayed while awaiting results of diagnostic testing. In this study, however, the likelihood of receiving antiviral treatment was much greater among those who received an influenza test than those who did not, although we were unable to distinguish patients who received antiviral treatment concurrently with an influenza test being ordered from those who received treatment after an influenza test result was known. The widespread reports that persons ≥65 years old may have some pre-existing immunity to H1N1pdm09 may have contributed to the reduction in influenza antiviral treatment, as well as the small decrease in influenza diagnosis compared to those ≤65 years old. However, an explanation for the lack of increased antiviral receipt among those with high-risk conditions remains unclear.

Less than half of respondents overall sought healthcare for ILI, and healthcare access factors reduced healthcare-seeking behaviour. Lacking insurance (among respondents 18–64 years old), a personal doctor, or the ability to afford healthcare reduced healthcare seeking significantly among the nearly 15,000 respondents with ILI in this study. Additionally, although unemployed respondents were not less likely to seek healthcare, those who did were less likely to receive influenza antiviral treatment. Thus, it is possible that access to appropriate medical care, including receipt of influenza antiviral drugs, may have been

affected for some persons by their healthcare access or employment status. Unemployment and lack of medical insurance have been associated with delayed or missed medical care or prescriptions because of cost[27, 28] while adults with a personal doctor experience improved health outcomes[29]. Furthermore, the U.S. unemployment rate may be associated with increased state reports of widespread influenza[30], and more severe outcomes from seasonal and H1N1pdm09 influenza infection have been observed in high poverty areas[31, 32]. If receipt of appropriate medical care was affected by access to healthcare or unemployment status, then the 10% of adults who reported unemployment[33], the 15% of adults who reported foregoing medical care because of cost[34], and the almost 18% of persons 18–64 years old who reported a lack of health insurance[34] during the 2009 pandemic could represent an unexplored risk group. To prepare for future pandemics, a better understanding of how reduced healthcare access may affect the appropriate treatment of persons with ILI is needed.

Interestingly, we also found that respondents who reported financial barriers to healthcare were more likely to report ILI, even after controlling for age, medical conditions, and employment. The reasons for this are unclear, but adults who report financial barriers to healthcare are more likely to have chronic conditions or poor health status[35]. Therefore, these respondents may have had other chronic conditions not evaluated in this study that place them at increased risk for influenza or may represent persons with poorly controlled chronic medical conditions.

This report is subject to several limitations. First, data in this study are self-reported and subject to recall and social desirability bias. Therefore, report of a clinical diagnosis of influenza or receiving an influenza diagnostic test may not represent actual clinical practice or decision-making. However, most estimates for chronic disease prevalence and high-risk behaviours from the BRFSS are similar when compared to other national surveys[36]. Additionally, the trends in ILI and receipt of influenza antiviral treatment in this report are similar to independent U.S. estimates of the number of H1N1pdm09 cases and the number of antiviral drug prescriptions filled for the treatment of influenza[7, 37]. Second, we only assessed risk factors available in the BRFSS during the 2009–10 influenza season; we did not have information on other medical conditions known to confer increased risk for complications from influenza, which range in prevalence from <1%–4.4% in the U.S. adult population [9, 38]. Therefore, some persons with high-risk conditions could be misclassified as having no high-risk medical conditions. However, we included those who reported any type of disability to capture some of these persons[39]. Third, we did not ascertain the duration between illness onset and first healthcare encounter for persons reporting ILI. Effectiveness of influenza antiviral treatment declines between 2–7 days after illness onset [9], and physicians may be less likely to prescribe antiviral treatment to individuals presenting during this period. Thus, the proportion of respondents receiving influenza antiviral treatment we report may underestimate the fraction that would have been treated if presenting earlier. The 2010–11 BRFSS ILI survey contains the time from illness onset to first healthcare encounter; inclusion of these data will help address this weakness in future analyses. Fourth, BRFSS data are collected only from households with a landline telephone, and our study is subject to selection bias resulting from exclusion of households with only cellular phones[40]. Finally, the BRFSS is a household survey that does not collect

information from persons in institutions, nursing homes, long-term-care facilities, and correctional institutions. Therefore, the results presented in this analysis do not generalize to these populations.

In conclusion, our findings suggest a higher risk for symptomatic influenza in persons with certain underlying medical conditions, behavioural factors, and healthcare access restrictions. It also identified areas of the 2009 pandemic response that could have been improved. Despite recommendations to administer prompt antiviral treatment to high-risk or persons ≥65 years old with suspected or confirmed influenza, receipt of influenza antivirals was not significantly higher for these groups. The data on antiviral use among high-risk or persons ≥65 years old presented in this report can inform communication efforts to physicians who care for these populations and improve compliance with antiviral treatment guidance. Finally, reduced healthcare access observed in this report may have delayed or prevented appropriate medical care for some respondents with ILI; future pandemic planning efforts should consider individual barriers to health care when designing response strategies.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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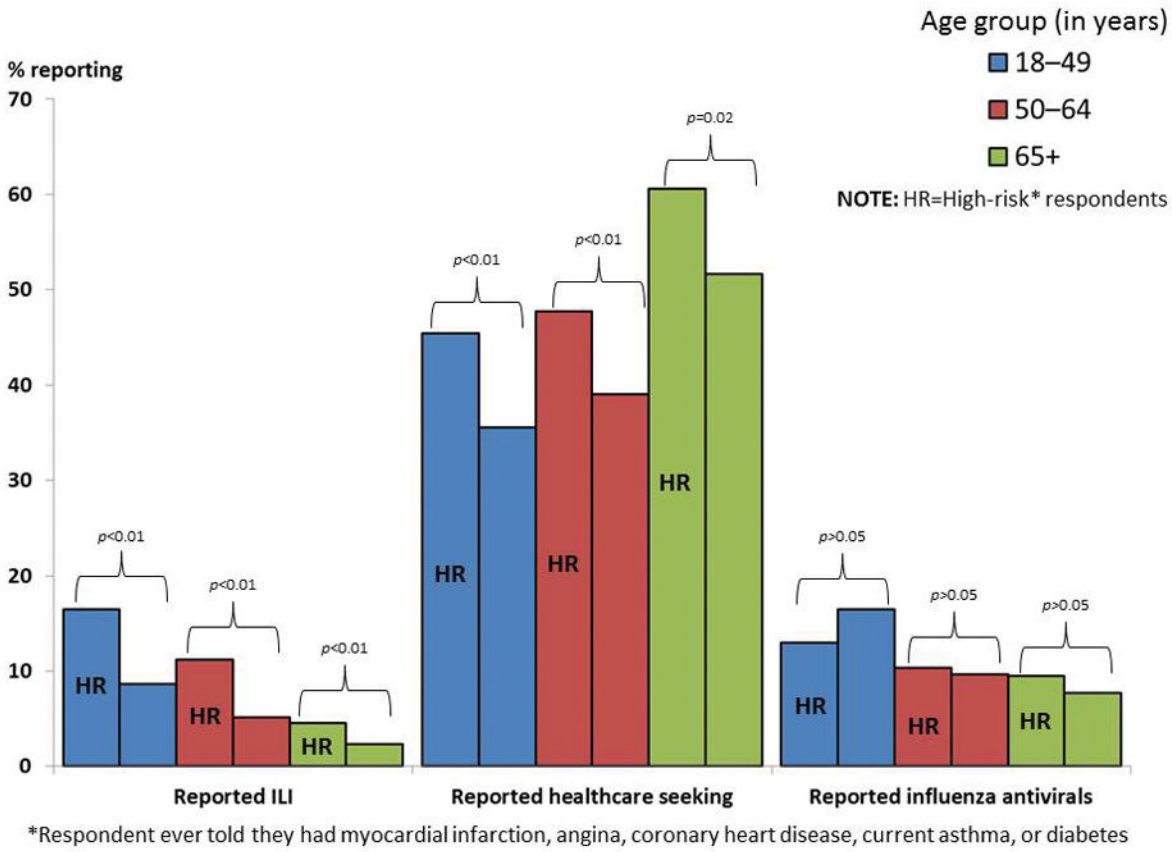

Figure 1.

Comparison among adults ≥18 years old with and without high-risk conditions of influenza-like illness, healthcare seeking for ILI, and influenza antiviral receipt among those who sought care, by age group, Behavioral Risk Factor Surveillance System, September 1, 2009 –March 31, 2010.

*Respondent ever told they had myocardial infarction, angina, coronary heart disease, current asthma, or diabetes

Table 1

Age and sex adjusted characteristics of respondents ≥18 years old who did and did not report influenza-like illness and healthcare seeking, Behavioral Risk Factor Surveillance System. September 1, 2009 –March 31, 2010.

Characteristics		Reported Influenza-like illness (ILI)			Sought healthcare for ILI		
		Yes n=14,611	No n=201,820	p value	Yes n=6463	No n=8138	p value
		% (SE)			% (SE)		
Age group	Age ≥65 years old[a]	6.7 (0.27)	17.9 (0.14)	<0.01	9.5 (0.52)	4.9 (0.29)	<0.01
Sex	Male[a]	42.6 (0.94)	49.0 (0.26)	<0.01	35.6 (1.44)	47.3 (1.24)	<0.01
Race/Ethnicity	White, Non-Hispanic (NH)	69.1 (0.93)	68.4 (0.28)	0.45	69.1 (1.59)	69.3 (1.19)	0.93
	Black, NH	8.9 (0.61)	10.6 (0.19)	0.01	10.0 (1.33)	8.5 (0.69)	0.32
	Hispanic	13.3 (0.75)	14.5 (0.25)	0.15	13.3 (1.22)	13.1 (0.95)	0.93
	American Indian/Alaska Native	2.3 (0.39)	1.03 (0.05)	<0.01	1.9 (0.31)	2.5 (0.57)	0.36
Level of education	Less than high school	13.6 (0.65)	12.0 (0.21)	0.02	13.5 (0.98)	13.5 (0.88)	0.99
	High school graduate	33.4 (0.88)	34.0 (0.27)	0.54	32.7 (1.48)	33.6 (1.13)	0.63
	Some college/college grad or more	53.0 (0.90)	54.0 (0.28)	0.26	53.8 (1.51)	52.9 (1.16)	0.64
Employment status	Employed	51.8 (0.85)	56.2 (0.27)	<0.01	50.0 (1.49)	52.8 (1.16)	0.12
	Unemployed	10.9 (0.61)	9.9 (0.20)	0.12	9.8 (1.05)	11.6 (0.77)	0.17
	Unable to work	11.4 (0.55)	5.7 (0.11)	<0.01	14.3 (1.19)	9.4 (0.57)	<0.01
	Homemaker	6.7 (0.36)	7.9 (0.13)	<0.01	6.1 (0.48)	7.2 (0.55)	0.14
	Student	5.6 (0.53)	4.9 (0.17)	0.26	5.7 (0.78)	5.4 (0.69)	0.82
	Retired	13.7 (0.35)	15.4 (0.08)	<0.01	14.1 (0.53)	13.5 (0.47)	0.39
Underlying condition	No chronic[b]	66.4 (0.84)	79.6 (0.20)	<0.01	62.5 (1.46)	69.5 (1.07)	<0.01
	Current asthma	18.3 (0.71)	8.0 (0.15)	<0.01	22.3 (1.28)	15.0 (0.87)	<0.01
	Diabetes	12.4 (0.56)	8.8 (0.12)	<0.01	14.6 (1.18)	10.9 (0.64)	<0.01
	Heart disease	11.0 (0.54)	6.1 (0.09)	<0.01	12.5 (1.14)	9.82 (0.63)	0.04
	Any chronic[c]	33.6 (0.84)	20.4 (0.20)	<0.01	37.5 (1.46)	30.5 (1.07)	<0.01
	Disability	36.8 (0.81)	21.2 (0.20)	<0.01	41.9 (1.46)	33.4 (1.01)	<0.01
Weight status	Underweight	1.87 (0.24)	1.78 (0.08)	0.72	1.84 (0.33)	1.77 (0.28)	0.87

Characteristics		Reported Influenza-like illness (ILI)			Sought healthcare for ILI		
		Yes n=14,611	No n=201,820	p value	Yes n=6463	No n=8138	p value
		% (SE)			% (SE)		
	Normal weight	31.6 (0.89)	33.6 (0.27)	0.03	29.9 (1.50)	32.9 (1.16)	0.12
	Overweight	31.7 (0.83)	36.0 (0.27)	<0.01	32.7 (1.45)	31.4 (1.05)	0.46
	Obese	34.8 (0.84)	28.6 (0.26)	<0.01	35.6 (1.34)	34.0 (1.09)	0.36
Pregnancy	Pregnant[a]	3.8 (0.81)	4.0 (0.23)	0.83	4.5 (1.12)	3.2 (1.15)	0.41
Smoking status	Current smoker	29.4 (0.85)	19.4 (0.23)	<0.01	26.2 (1.41)	30.7 (1.07)	0.01
	Former smoker	23.9 (0.65)	24.6 (0.20)	0.32	25.7 (1.12)	23.0 (0.83)	0.06
	Never smoked	46.6 (0.88)	56.0 (0.27)	<0.01	48.1 (1.49)	46.3 (1.14)	0.33
Alcohol use	Binge Drinker	17.4 (0.74)	15.4 (0.22)	0.01	13.9 (1.09)	19.6 (0.98)	<0.01
	Non-drinker	50.7 (0.87)	50.4 (0.28)	0.70	56.1 (1.5)	47.0 (1.10)	<0.01
	Moderate drinker	43.8 (0.89)	44.5 (0.28)	0.43	40.2 (1.49)	46.5 (1.14)	<0.01
	Heavy drinker	5.5 (0.44)	5.1 (0.13)	0.41	3.8 (0.55)	6.5 (0.60)	<0.01
Healthcare access	No insurance 18–64[a]	22.7 (0.91)	19.7 (0.28)	<0.01	13.6 (1.30)	28.5 (1.23)	<0.01
	No personal doctor	19.6 (0.78)	20.4 (0.25)	0.37	9.0 (0.86)	25.9 (1.05)	<0.01
	Financial barrier to care	26.5 (0.80)	15.7 (0.23)	<0.01	19.0 (1.01)	31.2 (1.08)	<0.01
Diagnostic testing	Tested for influenza	NA[e]	NA[e]	NA	31.8 (1.62)	NA[e]	NA
	Tested + for influenza[d]	NA[e]	NA[e]	NA	41.5 (2.82)	NA[e]	NA

[a] Estimate not age and sex adjusted since variable includes an age or sex component

[b] Respondent never told they had myocardial infarction, angina, coronary heart disease, current asthma, or diabetes

[c] Respondent ever told they had myocardial infarction, angina, coronary heart disease, current asthma, or diabetes

[d] Among respondents who reported an influenza test

[e] Estimate unavailable because influenza testing and the result only ascertained among respondents with ILI who sought medical care

Table 2

Characteristics associated with ILI among respondents 18–64 years old in multivariable analysis, Behavioral Risk Factor Surveillance System. September 1, 2009 –March 31, 2010.

Characteristics		Adjusted Odds Ratio (95% CI)
Age group (in years)	18 to 24	**2.47 (2.04–2.99)**
	25 to 34	**2.04 (1.78–2.34)**
	35 to 44	**1.66 (1.46–1.88)**
	45 to 54	**1.33 (1.19–1.48)**
	55 to 64	REF
Sex	Female	**1.29 (1.17–1.41)**
	Male	REF
Race/Ethnicity	Black, NH	**0.75 (0.63–0.90)**
	Hispanic	0.92 (0.78–1.08)
	American Indian/Alaska Native	**1.73 (1.17–2.57)**
	Other, NH	1.11 (0.91–1.36)
	White, NH	REF
Level of education	>High school	0.90 (0.76–1.05)
	High school graduate	0.92 (0.83–1.02)
	Some college/grad college	REF
Employment status	Unable to work	1.09 (0.94–1.27)
	Unemployed	0.95 (0.81–1.11)
	Homemaker	0.92 (0.78–1.07)
	Student	0.97 (0.75–1.24)
	Retired	**0.76 (0.63–0.91)**
	Employed	REF
Asthma	Current asthma	**1.88 (1.67–2.13)**
	Former asthma	**1.43 (1.17–1.75)**
	Never asthma	REF
Diabetes	Yes	1.15 (0.99–1.34)
	No	REF
Disability	Yes	**1.76 (1.57–1.96)**
	No	REF
Heart disease	Yes	**1.41 (1.17–1.70)**
	No	REF
Weight status	Underweight	0.82 (0.60–1.14)
	Overweight	0.96 (0.86–1.08)
	Obese	**1.15 (1.03–1.29)**
	Normal weight	REF
Smoking status	Current	**1.41 (1.27–1.57)**
	Former	1.00 (0.90–1.11)

Characteristics		Adjusted Odds Ratio (95% CI)
	Never	REF
Binge drinker	Yes	1.05 (0.91–1.21)
	No	REF
Heavy drinker	Moderate	1.09 (0.98–1.20)
	Heavy	1.11 (0.89–1.39)
	Nondrinker	REF
Health insurance	No	0.94 (0.81–1.08)
	Yes	REF
Personal doctor	None	0.89 (0.78–1.01)
	One or more	REF
Financial barrier to care	Yes	**1.63 (1.45–1.82)**
	No	REF

Table 3

Characteristics associated with ILI among respondents ≥65 years, Behavioral Risk Factor Surveillance System. September 1, 2009 –March 31, 2010.

Characteristics		Adjusted Odds Ratio (95% CI)
Age group (in years)	65 to 74	**1.78 (1.48–2.16)**
	≥75	REF
Sex	Female	**1.36 (1.13–1.64)**
	Male	REF
Race/Ethnicity	Black, NH	0.74 (0.51–1.09)
	Hispanic	0.94 (0.64–1.40)
	American Indian/Alaska Native	**2.69 (1.17–6.15)**
	Other, NH	1.18 (0.70–1.98)
	White, NH	REF
Level of education	>High school	1.08 (0.83–1.39)
	High school graduate	0.87 (0.72–1.04)
	Some college/grad college	REF
Employment status	Unable to work	1.39 (0.93–2.07)
	Unemployed, Homemaker Student, or Retired	0.89 (0.71–1.12)
	Employed	REF
Asthma	Current asthma	**2.74 (2.24–3.36)**
	Former asthma	**1.52 (1.02–2.25)**
	Never asthma	REF
Diabetes	Yes	1.18 (0.97–1.42)
	No	REF
Disability	Yes	**1.73 (1.45–2.05)**
	No	REF
Heart disease	Yes	**1.54 (1.27–1.85)**
	No	REF
Smoking status	Current	**1.74 (1.32–2.30)**
	Former	**1.21 (1.01–1.45)**
	Never	REF
Binge drinker	Yes	0.66 (0.39–1.11)
	No	REF
Heavy drinker	Moderate	0.96 (0.79–1.16)
	Heavy	**0.48 (0.27–0.86)**
	Nondrinker	REF
Personal doctor	None	0.71 (0.51–1.00)
	One or more	REF
Financial barrier to care	Yes	**1.71 (1.32–2.23)**
	No	REF

Table 4

Age and sex adjusted prevalence of characteristics of adults with ILI who sought healthcare who did and did not report receipt of influenza antiviral drugs, Behavioral Risk Factor Surveillance System. September 1, 2009 –March 31, 2010.

Characteristics		Receipt of influenza antiviral drugs		
		Yes n=620	No n=4645	p value Yes vs. No
		% (SE)		
Age group	Age ≥65 years old[a]	5.29 (0.94)	9.26 (0.58)	<0.01
Sex	Male[a]	33.0 (3.57)	34.8 (1.65)	0.65
Race/Ethnicity	White, Non-Hispanic (NH)	66.5 (3.55)	71.8 (1.78)	0.18
	Black, NH	7.9 (1.51)	9.6 (1.37)	0.40
	Hispanic	16.9 (3.09)	11.7 (1.29)	0.12
	American Indian/Alaska Native	NA[b]	NA[b]	--
Level of education	Less than high school	15.3 (2.80)	12.4 (1.07)	0.32
	High school graduate	32.5 (3.26)	31.7 (1.56)	0.83
	Some college/college grad or more	52.1 (3.54)	55.9 (1.69)	0.34
Employment status	Employed	51.3 (3.34)	51.7 (1.64)	0.91
	Unemployed	5.8 (1.34)	10.5 (1.36)	0.01
	Unable to work	12.1 (1.77)	13.1 (0.89)	0.61
	Homemaker	8.9 (1.77)	5.46 (0.48)	0.06
	Student	8.3 (2.51)	4.9 (0.84)	0.20
	Retired	13.6 (1.59)	14.3 (0.55)	0.68
Underlying condition	No chronic[c]	65.5 (3.01)	62.9 (1.36)	0.42
	Current asthma	20.5 (2.76)	21.2 (1.09)	0.83
	Diabetes	14.4 (2.05)	13.3 (0.87)	0.64
	Heart disease	13.0 (1.88)	11.6 (0.73)	0.48
	Any chronic[d]	34.5 (3.01)	37.1 (1.36)	0.42
	Disability	40.5 (3.36)	39.1 (1.45)	0.72
Weight status	Underweight	1.93 (0.74)	1.52 (0.25)	0.59
	Normal weight	27.9 (3.25)	30.0 (1.67)	0.57
	Overweight	35.6 (3.48)	31.6 (1.63)	0.30
	Obese	34.6 (3.43)	36.9 (1.62)	0.54
Pregnancy	Pregnant[a]	NA[b]	NA[b]	--
Smoking status	Current smoker	26.8 (3.36)	23.9 (1.29)	0.42
	Former smoker	22.1 (2.40)	26.6 (1.32)	0.10
	Never smoked	51.0 (3.47)	49.6 (1.64)	0.70
Alcohol use	Binge Drinker	16.5 (2.84)	13.3 (1.20)	0.29
	Non-drinker	56.4 (3.36)	55.4 (1.70)	0.78

Characteristics		Receipt of influenza antiviral drugs		
		Yes n=620	No n=4645	p value Yes vs. No
		% (SE)		
	Moderate drinker	41.0 (3.37)	40.4 (1.72)	0.87
	Heavy drinker	2.6 (0.90)	4.2 (0.76)	0.16
Healthcare access	No insurance 18–64[a]	12.2 (2.75)	13.5 (1.35)	0.68
	No personal doctor	6.9 (1.52)	10.0 (1.13)	0.10
	Financial barrier to care	19.9 (2.92)	19.5 (1.21)	0.90
Clinical diagnosis	Received influenza dx	75.3 (3.05)	22.9 (1.55)	<0.01
Diagnostic testing	Tested for influenza	54.1 (3.60)	27.0 (1.60)	<0.01
	Tested + for influenza[e]	77.8 (3.29)	28.4 (3.05)	<0.01

[a] Estimate not age and sex adjusted since variable includes an age or sex component

[b] Estimate unavailable because the un-weighted sample size for the denominator is<50 or the CI half width is >10.

[c] Respondent never told they had myocardial infarction, angina, coronary heart disease, current asthma, or diabetes

[d] Respondent ever told they had myocardial infarction, angina, coronary heart disease, current asthma, or diabetes

[e] Among respondents who reported an influenza test